The Identity of *Grimmia involucrata* Cardot (Grimmiaceae, Musci)

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ABSTRACT. *Grimmia involucrata* is a Mexican endemic that has been confused with *G. affinis*, *G. americana*, and *G. tergestina*. It is recognized here as a valid, morphologically distinct species characterized by clavate stems, a gonioautoicous condition, differentiated perichaetial leaves, immersed sporophytes, and the smooth basal third of the outer plate of the peristome teeth. It is illustrated herein.

Grimmia involucrata was described by Cardot (1909) on the basis of a specimen collected in the state of Hidalgo, Mexico. Reference to this species was made by Thériot (1931), who listed specimens collected by Amable in Mexico City; Sayre (1952) and Whitehouse and McAllister (1954) treated it as conspecific with *G. americana* Bartram, a species described from Texas (Bartram, 1929). Crum and Anderson (1981: 424) disagreed and concluded that *G. involucrata* was not "even a member of the subgenus *Gasterogrimmia* Schimp." In recent years, Crum (1994) treated it as a synonym of *G. affinis* Hornschuch; he also studied a mixed specimen from the type locality of *G. involucrata* that he referred to *G. tergestina* Tommasini, an Old World taxon.

Except for occasional reference in floristic lists or indices, information on *G. involucrata* is scarcely available. Descriptions other than the original have been lacking, as have illustrations. In addition, the type specimen is a mixed collection, which has contributed to confusion regarding the taxonomic identity and nomenclature of *G. involucrata* and other Mexican Grimmias. This paper attempts to clarify its status.

Grimmia involucrata Cardot, Rev. Bryol. 36: 105. 1909. TYPE: Mexico. Hidalgo: Cuyamaloya, on rocks, 17 Sep. 1908, *Pringle 10598 p.p.* (holotype, PC not seen; isotypes, FH, H-BR). Figure 1.

Stem clavate, dark green or black, up to 9 mm high, with a central strand; in cross section with an epidermal layer of 1–2 layers of smaller thick-walled cells. Leaves concave in proximal and mid-leaf sections, carinate at extreme apex, imbricate when dry, erect-spreading when moist, oblong-ovate, 0.9–1.3 mm in length; apex obtuse; distal leaf margins bistratose, plane, entire. Distal leaf cells quadrate to short rectangular, in 2(–3) layers of thick-walled, slightly sinuose cells, 5–12 μm diam.; marginal leaf cells at base quadrate to short rectangular or transversely elongated, with thicker cross walls, 7–17 μm diam.; other basal cells unistratose, quadrate to rectangular, thick-walled, slightly sinuose upward; basal juxtacostal cells not forming a distinct area, mostly quadrate and thin-walled. Costa excurrent, in section with one dorsal substereid layer and 2–6 guide cells around or ventral to an internal hydroid group. Hair-point 0.6–1.3 mm long, denticulate, slightly decurrent at base. Gonioautoicous. Perigonial bracts convolute, 0.6 mm long. Perichaetial leaves strongly differentiated, the outer with a hyaline marginal area, the inner mostly thin-walled and hyaline; oblong-ovate to convolute, 1.4–1.9 mm long; hair-point 0.9–1.6 mm long. Seta straight, 0.5 mm long, not twisted. Capsule symmetrical, ellipsoid, immersed, 1.2–1.4 mm long; peristome teeth somewhat cribrose, deltoid, 287–300 × 62–75 μm, straw-colored to orange, outer plate nearly smooth in the lower third, trabeculate, distally papillose; inner plate finely papillose throughout; annulus revoluble; exothecial cells prismatic, mostly longer than wide, thin-walled, 25–60 μm diam.; stomata several, basal; operculum conic, short-rostrate, 0.7 mm long; calyptra mitrate, smooth, 0.9–1 mm long. Spores 10–15 μm diam., spore wall perforated.

Distribution. Endemic to Mexico (Distrito Federal, Hidalgo, México, Zacatecas).

Habitat. On rocks or soil-covered rocks, in *Pinus* forest, dwarf oak forest, or desert scrub, 2180–2590 m elevation.

The costa in *Grimmia involucrata* is reported here as excurrent because there is morphological continuity of the inner costal cells with those of the hair-point. The latter consists, in addition, of hyaline laminal cells in this and other species of the genus, but its ontogeny is still unknown.

As noted by Cardot (1909), *G. involucrata* is similar to *G. tergestina*. Both taxa have clavate

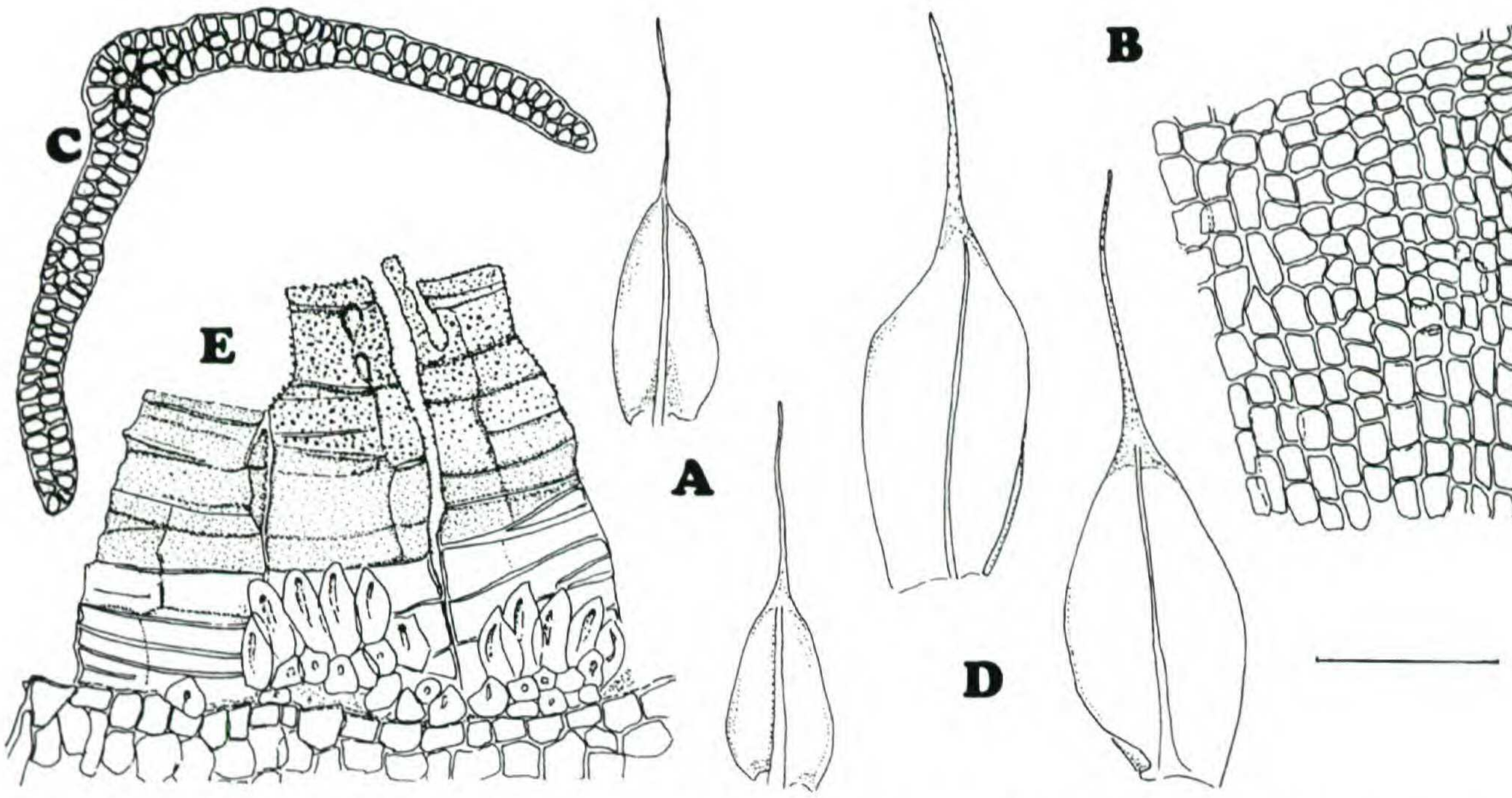

Figure 1. *Grimmia involucrata* Cardot. —A. Vegetative leaves. —B. Leaf basal cells. —C. Leaf cross section in distal half. —D. Perichaetial leaves. —E. Portion of peristome showing smooth outer plate and papillose distal end of broken teeth. Drawings from the type specimen, except A (*Cárdenas 3018*) and E (*Cárdenas 3912*). Scale = 1 mm (A, D), = 0.1 mm (B, C, E).

stems due to large differentiated perichaetial leaves that enclose an immersed sporophyte; their vegetative leaves are bistratose in the distal half bearing a decurrent denticulate hyaline hair; the basal leaf cells are quadrate to short rectangular and, in section, the costa has several guide cells frequently surrounding a single hydroid group. Although similar in general morphology, the gametophore in *G. involucrata* is consistently gonioautoicous and the peristome teeth are papillose except at the outer base and have conspicuous trabeculae. In *G. tergestina* the gametophore is dioicous and its peristome teeth virtually lack basal trabeculae and are papillose throughout. The taxonomic significance of these differences remains problematic; the peristome structure in *G. tergestina* is comparable to that of *G. involucrata* so that their only reliable morphological difference is the sexual condition.

According to Churchill and Linares (1995), *Grimmia affinis* is not present in the Neotropics and may be a synonym of *G. longirostris* Hooker. In any event, neither *G. affinis* nor *G. longirostris* is closely related to *G. involucrata*. Their leaf cross sections show an elliptical to reniform costa with a ventral u-shaped sinus distally; at mid-leaf, there is a row of 2–4 ventral guide cells overlying a central hydroid group and a dorsal epidermal layer of substereid cells; the capsule is exserted in *G. affinis*. Thus, the proposed synonymy between this and *G. involucrata* (Crum, 1994) does not have a taxonomic basis, for they are clearly distinct. The confusion apparently derives from plants of a second *Grimmia* in the type specimen of *G. involucrata*. Cardot (1909) stated that this contained *G. ovata* F. Weber & D. Mohr, a taxon currently considered a synonym of *G. affinis*. A similar mixture was observed in *Pringle 10599* (MEXU), also from the type locality.

At present, *Grimmia involucrata* is considered a valid species endemic to Mexico. Its presumed distribution in Texas is based on collections of *Grimmia americana*, a species that is distinguished by its ventricose sporophytes.

Specimens examined. MEXICO. **Distrito Federal:** Zacatenco, *Amable 1352* (MEXU); Tlalpan, *Amable 1448* (MEXU). **Hidalgo:** Cuyamaloya, Sierra de Pachuca, *Pringle 10599 p.p.* (MEXU); alrededores de Ciudad Sahagún, *Cárdenas 3108* (MEXU). **México:** Sierra de Alcaparrosa, 4 km NW de Tepotzotlán, 19°44′N, 99°15′W, *Cárdenas 3912* (MEXU). **Zacatecas:** 1 km S de Troncoso, *Cárdenas 3092* (MEXU); Cerro Gordo, 3 km SE de La Colonia Hidalgo, 22°30′N, 102°13′W, *Cárdenas 736* (MEXU); 2 km S de San Juan de los Hornillos, cerca de Presa Hornos, 23°01′N, 103°11′W, *Cárdenas 752* (MEXU).

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